

**Responses to the Colorado Department of Public Health and  
Environment Comments on the Draft RCRA Facility  
Investigation/Remedial Investigation Report for Operable Unit 3**

This document provides responses to formal comments from the Colorado Department of Public Health and Environment (CDPHE) regarding the Draft RCRA Facility Investigation/Remedial Investigation Report for Operable Unit 3, Offsite Areas. Each comment received from CDPHE is presented below in **Bold** type followed by the corresponding response.

**General Comments**

1. **An evaluation of exposure to non-radionuclides in soils was not required by the OU 3 Work Plan, but its absence represents an underestimation of risk. The impact of this missing information is never mentioned in this document, including in the uncertainty analysis. This missing information must be kept in mind when making any risk management decisions, especially since the risks from potential exposure to radionuclides fall right above the  $1 \times 10^{-6}$  trigger level.**

**Response:**

There is no missing information. The Final Past Remedy Report, Operable Unit 3 - IHSS 199, DOE 1991, provides an extensive review of previous studies, releases, and potential contaminants. The RFI/RI Final Work Plan for OU 3 Rocky Flats, DOE 1992, also provides summary of this information and determines the objectives of the field investigation. In both of these documents, radionuclides are the only issue for soils. The field sampling plan outlined in the work plan approved by the CDPHE and the EPA (Hestmark to Lockhart March 19, 1992) focuses on radionuclides because all parties agreed that there was no evidence to suggest that non-radionuclides could be a problem in OU 3. Furthermore, on February 17, 1995, the Environmental Protection Agency, Colorado Department of Public Health, and Department of Energy approved the list of Chemicals of Concern (COCs) at Operable Unit 3 (see *Dispute Resolution Agreement by the IAG Project Coordinators, Operable Unit No. 3 Contaminants of Concern Technical Memorandum No. 4, February 10, 1995*). For media other than surface soils, chemicals, metals, and radionuclides were evaluated to arrive at the final list of COCs. Since non-radionuclides are not COCs at Operable Unit 3, their contribution to risk has already been determined by the aforementioned agencies to be insignificant.

2. **The assessment of risk in this document is based on a very limited data set. As mentioned in CDPHE comments on Technical Memorandum (TM) #4, COC Selection (General Comment #2), the**

limitations in the data really only allow a qualitative human health risk assessment, as stated in this RFI/RI document. The lack of good data makes any risk estimates relatively uncertain compared to those possible on other OUs. This larger amount of uncertainty should be taken into consideration when making any risk management decisions.

Response:

We strongly disagree that OU 3 "lacks good data." The data set collected for the OU 3 risk assessment was defined in the OU 3 Work Plan which was approved by CDPHE (Baughman to Hestmark January 14, 1992). The sampling plan was statistically designed to achieve an 80-percent confidence with a minimum detectable difference of 20 percent. This approach was considered valid and was approved by all parties.

3. The application of professional judgement in the form of a "weight of evidence" procedure was performed incorrectly. By performing the weight-of-evidence comparison at the end of the COC selection process, after the concentration-toxicity and frequency screens, instead of at the beginning, in place of the Gilbert statistical procedure for those media that have enough data, the risk-driving chemicals have effectively been determined and then eliminated from the assessment because of professional judgement. This was unacceptable in TM #4 (General Comments #3 in joint CDPHE and EPA comment letter), and still is unacceptable. This same comment was made on OU 2, OU 5, and OU 6 documents.

Response:

The COCs selected in TM 4 were approved by the EPA and CDPHE on February 17, 1995. Therefore we believe that both the COC selection process and the COC's selected by that process are in fact acceptable to both EPA and CDPHE.

4. The toxicity of chemicals without toxicity factors was not considered in this report. These chemicals were identified in TM #4, and should have been carried through as PCOCs and discussed in the RFI/RI uncertainty analysis, as per RAGS guidance (Part A, page 5-23).

Response:

Analytes without toxicity factors were evaluated in Technical Memorandum 4, COC Identification. Through the "weight of evidence" evaluation, all analytes without toxicity factors were eliminated from further consideration. Therefore, these analytes were actually evaluated as Potential Chemicals of Concern

(PCOCs). No discussion in the uncertainty analysis is warranted.

### **Specific Comments**

1. **Executive Summary (Page ES-5)**

In the second paragraph in the Surface Water section, the sentence which reads, "VOCs in Mower Reservoir were not detected," might more correctly be stated, "VOCs were not detected in Mower Reservoir."

Response:  
Comment Incorporated

2. **Figures 4-6A and 4-6B**

There are similarities between these isoplots for Pu and Am and OU 2's isopleth maps, but there are also differences. Explain the reasons for the differences between these maps.

Response:  
Differences between the plutonium and americium isoplots on these two maps and the OU 2 isopleth maps are a result of the larger sample area and greater number of data points used for developing the OU 3 maps.

3. **Figure 4-9**

Some of the profiles shown in this illustration are increasing at the bottom of the sampling interval. Sampling location #SED09292, at the influent from Walnut Creek, may not have reached possible Pu contamination. If these sediment samples may have missed some of the Pu-contaminated intervals due to lack of sampling depth, the text needs to so state.

Response:  
Due to effects of wave action and fluctuating reservoir levels over time at the influent and shoreline areas, sediment thickness near the shoreline is less than sediment deposits in the deeper, lower energy portions of the reservoir (Blatt, Middleton, and Murry, 1980). As such, sample intervals collected closer to the shoreline will be thinner than those collected in the deeper portions of the reservoir. Cores were advanced as far as possible. The core sample logs indicate that the entire sediment interval was sampled; no sediment intervals were missed. The USGS report (Characterization of Selected Radionuclides in Sediment and Surface Water in Standley Lake, Great Western Reservoir, and Mower Reservoir, Jefferson County, Colorado, 1992, USGS, Water Resources

Investigation Report 95-4126, 1995) contains sediment logs which show the base of the core being equivalent to the base of the reservoir at location SED09292.

4. **Section 4.3.2 (Page 4-39)**

The text states that, "Figure 4-9 shows the natural variation of the uranium isotopes with depth." However, that phenomenon is illustrated as part of Figure 4-8. Also, Page 4-35 repeats the profiles shown on Page 4-45. Explain the "natural variations of the uranium isotopes with depth."

Response:

These figure references will be corrected for the final report.

The following text will be added regarding variation of uranium isotopes with depth in soil:

Figure 4-8b shows the variation in activity of the uranium isotopes with depth. Unlike the plutonium and americium activities measured in the trenches, which display a decrease in activity with depth, the uranium isotope activities do not exhibit a decrease with depth. The activities of uranium isotopes are much more randomly distributed. This suggests that the uranium isotopes occur naturally in the subsurface soils as part of the soil constituents. The trend exhibited by plutonium and americium, is consistent with the areal deposition of contaminants onto the surface soils, and also demonstrates plutonium's recalcitrance to vertical mobility. If uranium were deposited in OU 3 as an airborne contaminant, it would be expected to exhibit a depth/concentration profile similar to americium and plutonium. Radionuclide activity profiles for all trenches are provided in Appendix H.

5. **Section 4.3.2. (Page 4-39)**

The 7th paragraph in this section mentions UTL exceedances for uranium. These exceedances may be significant, particularly because they are located along the Woman Creek drainage. There is strong historical and analytical evidence that U-238 is a chemical of concern in OU 5 upstream from OU 3. RAGS, Part A, page 5-21, states that, "chemicals reliably associated with site activities based on historical information generally should not be eliminated from the quantitative risk assessment, even if the results of the procedures given in this section indicate that such an elimination is possible." Uranium was eliminated by means of a PRG comparison, but it needs to be shown additionally that it is likely to be naturally occurring and not tied to plant activities.

Response:

See response to Specific Comment No. 4. Additionally, the uranium-238 activity profiles for each of the eleven trenches (presented in Appendix H of the RFI/RI report) show variation in activity of uranium isotopes with depth, suggesting that the uranium isotopes occur naturally in the subsurface soils. By approval of Technical Memorandum 4, COC Identification, the agencies agreed that uranium-238 is not a COC in OU 3.

6. **Section 4.4 (Page 4-40)**

**Explain how a dissolved fraction concentration can be greater than the corresponding total (unfiltered) concentration.**

Response:

For surface water analysis of certain major ions (e.g., Ca, Mg, K, Na) it is not unusual to have greater dissolved fraction concentrations than the corresponding total concentrations. This is generally due to matrix effects from analysis of the unfiltered samples (due to inter-element interferences and/or modification of the shape of the ICP plasma by unfiltered organic compounds). In addition, filtering of samples does not always exclude cations from going through the analysis. The .45 micron filters used in the analysis are designed to filter out the nominal bacteria size. This filter size is the industry standard but is not entirely effective for filtering out metal cations. During data evaluation and clean up, the reasonableness of analytical results is evaluated. In cases where the dissolved fraction significantly exceeds the total fraction, the results are questioned. Evaluation of the OU 3 data did not identify any significant exceedances by the dissolved fraction.

7. **Sections 4.6.3 and 7.1.4 (Pages 4-69 and 7-2)**

**The statement that "the groundwater pathway is not a complete pathway" must be explained and justified. No groundwater COCs have been identified for OU 3. However, what prevents a complete pathway via groundwater wells in the future?**

Response:

See response to Specific Comment No. 8. The text under Subsection 4.6.3 will be replaced with the following:

Groundwater analyses indicate that plutonium-239, -240 is not migrating from reservoir sediments to the groundwater system in OU 3. Based on a qualitative comparison to background groundwater data, potassium and strontium were the only constituents detected above background levels in Well 49192, located downgradient from the Great Western Reservoir dam. No constituents were detected above background levels in Well 49292, located downstream from the Standley Lake dam. No COCs were identified for OU 3 groundwater.

The statement that the groundwater pathway is not a complete pathway in Subsection 7.1.4 will remain as written. On February 17, 1995, the Environmental Protection Agency, Colorado Department of Public Health, and Department of Energy agreed in 1992 with approval of the OU 3 work plan that the groundwater pathway investigated in the OU 3 project is not a complete pathway (see *Dispute Resolution Agreement by the IAG Project Coordinators, Operable Unit No. 3 Contaminants of Concern Technical Memorandum No. 4, February 10, 1995*). This approach is consistent with the objectives the OU 3 Work Plan which stated that contaminants were not leaving the RFP via the ground water pathway. In meeting minutes from 5/3/94, and 2/14/94, both EPA and the State reiterated their belief that ground water was not considered a pathway. In addition, geologic characterization documents, and the Final Ground Water Conceptual plan for RFETS describe ground water as emerging as surface water prior to leaving the Site boundaries.

**8. Section 5.1.2 (Page 5-4)**

**The first paragraph in this section does not list groundwater as a reasonable pathway from Rocky Flats. In light of comments at recent public meetings, this conclusion needs to be more thoroughly explained somewhere in this document.**

Response:

The following text will be added in Subsection 5.1.2 after the 2nd sentence of the 1st paragraph:

Since there is no apparent migration of contaminants into groundwater from reservoir subsurface sediments, groundwater is not considered a complete pathway from a human health exposure standpoint. Analyses of groundwater samples collected from the Great Western Reservoir and Standley Lake monitoring wells indicate no contaminants present in groundwater and no movement of radionuclides through reservoir sediments into groundwater. Additionally, a comparison of subsurface sediment plutonium activities from the OU 3 RFI/RI data with plutonium activities in subsurface sediment samples collected during historical studies (DOE, 1994c) indicates that there is no vertical migration of plutonium in the sediments over time. The plutonium contamination is confined within discrete subsurface horizons.

**9. Section 7.5 (Page 7-7)**

**Any conclusions regarding future action or no-further-action at OU 3 is not appropriate in the context of an RFI/RI Report.**

Response:

The following text will be added in Section 7.5 to replace the last sentence of

the first paragraph:

Given these considerations, additional investigations or remedial actions are not anticipated for OU 3. Future action decisions, however, will be documented in the Record of Decision following approval of the OU 3 Proposed Remedial Action Plan.

**10. Appendix A - Executive Summary (Pages A-3 and A-4)**

**It is not clear in this section which exposure pathways are included in the risk estimates. Are the indirect pathways included as well as the direct pathways? Explain the statement concerning the RME estimated excess lifetime cancer risks, "this includes risk from all pathways except internal and external radiation." What is left if these pathways are excluded?**

Response:

The pathways evaluated for each exposure scenario are listed in the Executive Summary. They include soil or sediment ingestion, inhalation, consumption of fruit, vegetable, beef, milk, and external radiation exposure for a residential scenario. The pathways for a recreational scenario include ingestion of soils or sediments, inhalation, and external radiation exposure. The statement "except internal and external radiation" will be deleted from the text.

**11. Appendix A - Executive Summary (Pages A-6 and A-7)**

**As mentioned in General Comment #1 above, this report should mention the uncertainty that comes from not assessing the non-radionuclide chemicals in surface soils at OU 3. In addition, DOE did not discuss the uncertainty due to exposure to more than one chemical.**

Response:

See response to General Comment No. 1. Also, adding the risks due to multiple contaminants is discussed in the Executive Summary on Page A-3. The following statement will be added to the end of the fourth paragraph on page A-3: "The assumption of additivity could underestimate or overestimate risks."

**12. Appendix A - Section A2.3 (Page A-14)**

**The discussion on this page of current and potential agricultural receptors is much improved over previous reports. However, there is no mention of cattle herds in this discussion. Since beef ingestion is later assessed, it should be mentioned here.**

Response:

The following statement will be added to the second paragraph on Page A-14:

"The presence of cattle have been noted east and southeast of the site."

13. **Appendix A - Section A2.5.5 (Page A-17)**

**Especially in a public document, use of jargon such as "benchmark" (as a verb) should be explained or avoided.**

Response:

The word "benchmark" will be changed to "verify."

14. **Appendix A - Figure A3-1 and Section A3.6 (Pages A-19 and A-30)**

**The CDPHE Conservative Screen Process includes an ARARs comparison step along with assessment of dermal exposure prior to a decision on whether a site is acceptable for no further action. The text and the diagram should be corrected to include this step.**

Response:

The text and Figure A3-1 will be corrected to include the ARARs comparison step.

15. **Appendix A - Section A3.2 (Page A-20)**

**Both CDPHE and EPA have commented on the use of literature benchmark data for comparison with OU 3 data as part of the "weight-of-evidence" approach. Front Range soil data or Rocky Mountain National Park lakes simply cannot be compared with Rocky Flats areas without some geochemical analysis and matching. An adequate geochemical comparison has never been provided.**

Response:

The use of benchmark data was approved in the Technical Memorandum 4 approval dated February 17, 1995 (see *Dispute Resolution Agreement by the IAG Project Coordinators, Operable Unit No. 3 Contaminants of Concern Technical Memorandum No. 4, February 10, 1995*). The purpose of using benchmark data is not as a tool for direct comparison, but as a means of establishing a range of concentrations for a constituent. This concentration range can be considered to represent natural variations in the environment. A geochemical analysis or comparison is not necessary if the benchmark process is considered from the perspective of its intended use. Uncertainty does exist in the quality and usability of the benchmark data, but realizing this uncertainty when using these data in the comparisons, and combining the conclusion reached from these comparisons with the other weight of evidence steps bolsters the conclusion that these data represent general background



conditions as do the OU 3 data.

**16. Appendix A - Section A.3.2.5 (Page A-25)**

Lake and stream data has apparently been combined since any stream data comparisons seem to be lacking in this RFI/RI Report. Both agencies have stated that the weight-of-evidence approach should only be used for lake sediment and lake water analyses. Appropriate site-specific background data for stream reaches between Indiana St. and the reservoirs exists, and should have been used. Even if the stream data was limited, it would not be appropriate to combine stream and lake sediment data, because different COCs are likely in these two different environments. Only the power of the statistical assessment would be limited by comparing the limited data set to the Background Geochemical Characterization Report (BGCR) data. The statistical assessment of OU 3 data and BGCR data still would have been appropriate to do on the limited stream data available.

Response:

Lake and stream data were not combined for stream data comparisons. The site-specific background data for stream reaches between Indiana Street and the reservoirs were used for comparison with OU 3 stream data. The stream data comparisons are presented in Table 4-4 of the RFI/RI report. Reservoir data were compared with benchmark data for both surface water and sediment. This comparison is summarized on Table 4-4 and 4-5. These tables, as well as the remaining background/benchmark comparison tables for each medium, will be modified to clarify these comparisons.

**17. Appendix A - Section A3.4 (Page A-29)**

For the last sentence in this section to make sense, the word "no" should be inserted before the word "PCOCs."

Response:

Comment incorporated

**18. Appendix A - Section A3.6 (Page A-36)**

As noted in General Comment #1, an analysis of organic chemicals in surface soil has not been included. Therefore, this discussion on the risks from dermal contact with surface soil is incomplete.

Response:

As stated in the agency-approved OU 3 Work Plan (Section 2.5.1.1), volatile organic compounds were not analyzed for in surface soil due to the high likelihood of volatilization. Since the airborne pathway is the only reasonable

migration pathway contributing to offsite surface soil contamination from volatile organic compounds, it is unlikely that volatile contamination exists in OU 3 soils. Semivolatile organic compounds typically are much less mobile than volatile compounds. Semivolatile compounds have not been detected in significant levels upgradient of OU 3 and, therefore, were not required to be analyzed in OU 3 soils.

See response to General Comment No. 1.

**19. Appendix A - Section A4.1.2 (Page A-40)**

**Essential elements should not be eliminated blindly, but first compared to levels that can cause toxicity according to Region VIII COC selection guidance (also RAGS, part A, page 5-23). Text should be changed to acknowledge this.**

Response:

The essential nutrient screen and results of the screen were approved as part of the Technical Memorandum 4 approval dated February 17, 1995.

**20. Appendix A - Table A4-2 (Page A-47)**

**Why was Americium eliminated as a COC in sediments from Great Western? As a daughter of plutonium, which was included as a COC, its concentrations will continually increase.**

Response:

Americium-241 was eliminated as a COC by the Preliminary Remediation Goal comparison step of the COC selection process. This process was approved as part of the Technical Memorandum 4 approval dated February 17, 1995.

**21. Appendix A - Table A4-5 (Page A-52)**

**Does "NA" really mean "Not Acceptable" as indicated at the bottom of this table?**

Response:

"NA" will be defined as "Not Applicable."

**22. Appendix A - Sections A5.2.1.1, A5.2.2.1, A5.2.2.2., A5.3.2.1 (Pages A-54-A-62, A-68)**

**The text in this section is not clear on how the exposure point concentration was calculated until Section A5.3.2.1. Since this is a public document, these sections should be revised to avoid confusion.**

The clarity of this document and ease of review would both have been improved by adding a table showing all the exposure point concentrations used for each exposure pathway. Section A5.3.2.1, for example, would have been much more lucid if this had been done.

Response:

Exposure point concentrations for all exposure scenarios are delineated in Section A5.3, "Exposure Pathways Selected for Quantitative Analysis." The following sentence will be added to the end of the last paragraph in Section A5.2. (Exposure Pathway Analysis): "Exposure pathways and exposure point concentrations are discussed quantitatively in Section A5.3, "Exposure Pathways Selected for Quantitative Analysis."

**23. Appendix A - Section A5.3.1 (Page A-63)**

The second paragraph in this section states that, "intakes are not estimated for any exposure pathway except soil (IHSS 199) and sediment (IHSS 200) ingestion." This statement is unclear, since DOE did intake and risk calculations for indirect pathways such as vegetable ingestion as well.

Response:

The referenced sentence will be deleted from the text.

**24. Appendix A - Section A5.3.2.1 (Page A-68)**

As mentioned in Comment #22 above, the information in this section would have been much more easily understood if a table showing which soil concentrations were used as exposure point concentrations for the ingestion calculations had been supplied. It is likewise unclear what concentrations were inputs to the box model for air at sample locations U1A, U2A, and PT134192.

Response:

See response to Specific Comment No. 22.

**25. Appendix A - Sections A5.3.2.1 and A5.3.2.2 (Pages A-68 and A-70)**

This report needs to include a series of tables showing the exact calculations used to determine the exposure point calculations for the air pathway. Reviewing the detailed assumptions and calculations that were used to go from the box model to the ARC equation in Attachment 3, Table 23-Table 26 and Table 5-Table 8 is

necessary to determine if this procedure is appropriate. If this information has been provided elsewhere in this report or in another document, it should be referenced.

In addition, what is the justification for using the "R" factor (Activity in dust/activity in soil) in these calculations? Where do these numbers come from? Are they site specific?

Response:

The additional equation and pertinent information used to calculate from the box model to the Airborne Radioactivity Concentration equation, presented in Attachment 3, will be added in Subsection A5.3.2.1.

As discussed in Section 4.7.2 Wind Tunnel Study of the RFI/RI report, the "R" factor is the resuspension ratio of radionuclides in the resuspended material to radionuclides in the soil. The resuspension ratio was calculated using results of radiochemical analyses for resuspended material and collocated soil samples collected at each of the wind tunnel sampling sites. Evaluation of these results indicates that the radionuclide activities in the resuspended particulates range from .5 to 7.6 times higher than in situ soil and sediment concentrations. This discussion will be referenced.

**26. Appendix A - Table A6-1 (Page A-74)**

A footnote to this table says, "The toxicity constants for Americium-241 will be used for Plutonium-239, -240." Explain this statement and under what conditions it would apply.

Response:

This statement does not apply. This footnote has been deleted.

**27. Appendix A - Section A6.2.1 (Page A-75)**

Explain the meaning and use of an "intake-to-risk conversion factor." An explanation of this and other terms would be useful to both agency and public readers.

Response:

The "intake-to-risk conversion factor" reference will be removed from the text.

**28. Appendix A - Tables A7-7 & A7-8 (Pages A-85 - A-88)**

RAGS, Part B, page 23 designates the Age Adjusted Ingestion Rate as 114.3 mg/kgd, not 108.6 mg/kgd. Also, the titles on these two tables are switched. Table A7-7 contains beryllium data, not arsenic data, and vice-versa.

Response:

The Age Adjusted Ingestion Rate will be changed from 108.6 mg/kgd to 114.3 mg/kgd. The table titles will be changed.

**29. Appendix A - Section A8.0 (Page A-90)**

**The Uncertainty Analysis is limited by the following:**

- This section does not discuss the impact to the uncertainty of the risk estimates due to a lack of analysis of any non-radionuclides in surface soil (see General Comment #1).
- This section should also discuss uncertainty introduced into the risk estimates by not including those chemicals which were identified in TM #4 as not having toxicity factors (see RAGS, Part A, page 5-24 and General Comment #4 above).

Response:

See General Comment No. 1 and General Comment No. 4.

**30. Appendix A - Attachment 1, Table 1**

**The Central Tendency soil and sediment ingestion exposure factors listed under the Future Recreational scenario were not agreed to. After both agencies rejected these numbers, DOE agreed to use 50 and 25 mg/d for child and adult ingestion, respectively (June 15, 1995 letter attached to revised Exposure Factors Template). It appears that the correct agreed-upon exposure factors have been used in Table 3 of Attachment 3; only the appropriate exposure factors in Table 1 need to be revised.**

**The use of a soil or sediment matrix effect in GI tract (absorption factor) has been proposed in the past, but neither CDPHE nor EPA have approved it. The rationale for the agencies' refusal of the proposed use of these matrix effects is that it is not toxicologically appropriate to use a single soil matrix effect across the board, without including site-specific information. The 0.5 value is not conservative all the time for all chemicals, and does not accurately reflect the bioavailability of all chemicals at Rocky Flats. This soil matrix factor should be deleted from all text and tables, and the intakes and risks which were calculated using this factor should be re-done. As it is, all central tendency risks that were calculated using the 0.5 matrix effect value are slightly underestimated.**

**This table lists a Fraction Ingested from Contaminated Source for the child and the adult receptor. However, this factor has never been approved by either agency. In a letter to Steve Slaten dated April 11, 1995, EPA, with the concurrence of CDPHE, directed DOE**

to delete the "fraction contacted from the contaminated source" parameter for all open space receptors. The only acceptable FC for RME estimates = 1. It is CDPHE's understanding that FC = 1 for RME estimates applies to all receptors. Though it appears that DOE followed this agreement for the RME receptors, CDPHE does not believe that final discussions ever took place over the CT values or that agreement was ever finalized for this fraction contacted. The agencies' rationale for disapproving of this fraction contacted is that except for the ingestion of homegrown produce under a residential scenario, agency toxicologists feel that the fraction contacted factor is acceptable. These factors are described as time-weighted factors in the Template footnotes (June 15, 1995 version). Both CDPHE and EPA believe these factors double-count the time component since the exposure frequency has already been reduced to account for the average time spent at the location. In addition, the exposure point concentration term represents the integrated contaminant concentrations which a receptor contacts on average over a period of time, and already takes activity patterns into account.

Response:

Attachment 1, Table 1 will be changed to reflect the central tendency soil ingestion rates referenced in the comment. Risk calculations will not change though, since the currently approved central tendency values were used in all radiation risk and dose calculations.

The matrix effect was not used in calculating risk in Attachment 3. In Attachment 1, Table 1, the matrix effect variable has been deleted.

Fraction ingested from contaminated source is based on the fraction of the day an individual would be present at a residence. This is different from the number of days per year someone stays at a residence, which is the exposure frequency. These are two separate variables that should be assessed separately. Also, the Reasonable Maximum Exposure (RME) value is the 90th to 95th percentile value for an exposure factor distribution. To set the central tendency value equal to the RME value is not correct. Therefore, we do not believe that the central tendency value and the RME value should be made equal for the Fraction Contacted for Contaminated Source variable.

**31. Appendix A - Attachment 1, Table 2**

This table lists the approved site-specific Respirable Fraction (PM10) for RME and CT receptors. However, DOE does not appear to use this exposure factor later on in the intake and risk calculations, as it was set to 1 for both RME and CT receptors. Was

this factor dropped because the PM10 factored into the box model? Please provide an explanation.

This table substitutes a Respiratory Deposition Factor (RD) of 0.85 into the intake equations for the Respirable Fraction. Neither EPA nor CDPHE agree with the use of the 0.85 respiratory deposition factor, even though it was included in the Template. A major problem with the 0.85 respiratory deposition factor is that without chemical-specific pharmacokinetic data, it is toxicologically unsound to assume that less than 1000% of the small ( $< 10 \mu\text{m}$ ) particulates deposited in the upper respiratory tract are not available to cause local tissue damage or systemic effects after absorption through the upper respiratory passages or after being coughed up and swallowed. Both CDPHE and EPA toxicologists believe that this deposition fraction should be removed. All inhalation pathway equations that used the RD should be revised, and the calculations corrected. The phrase "in combination with others" is repeated in Footnote 1.

Response:

The Respirable Fraction was factored into the box model.

The basis for the use of the Respiratory Deposition Factor (RDF) was reviewed. Since the PM10 fraction was also used in the inhalation equation, the RDF will not be used further. The inhalation risks and doses will be recalculated without the RDF.

The Footnote 1 comment will be addressed.

**32. Appendix A - Attachment 1, Table 4**

The Washoff Factor is included in the June 15, 1995 version of the Template, however, any of these exposure factors which serve to decrease risks were still under negotiation. The value in this table, 0.5, is not unreasonable number for a central tendency washoff factor, but it should be based on something more than an arbitrary estimate that, "at least one-half of all contaminated soil or dust particles adhering to root and leaf vegetables and to fruits." Does the Department of Agriculture have any estimates of average amount of dirt washed off of fruits and vegetables?

Response:

The Environmental Protection Agency Transuranium Elements, Volume 2, Technical Basis for Remedial Actions (EPA/520/1-90-016) uses a 90-percent washoff factor for leafy vegetables and a 99-percent washoff factor for other

food plants. For conservatism, no washoff factor was used for RME exposures, and a 50-percent washoff factor was used for CT exposures.

**33. Appendix A - Attachment 1, Table 5**

The recommendations in the 1990 EPA document (EPA/600/6-9/003), that DOE references as the source of beef and milk ingestion rates have been superseded by those in several other, more recent documents. The OSWER Directive 9285.6-03, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" states that, "the EFH (Exposure Factors Handbook) provides average ingestion rates for beef and dairy products, and assumes that the farm family produces 75 percent of what it consumes from these categories. This corresponds to a "reasonable worst case" (or RME) consumption rate of 75 g/day for beef and 300 g/day for dairy products." These higher, and more recent recommendations for RME values should be used. In addition, the EFH average values should be used for the CT exposure factors, since that is a more standard information source than the one that DOE used. Finally, a new draft EFH is out for comment. This document also lists higher average and 95th percentile values for beef and milk intake than used by DOE in this assessment. Therefore, DOE should correct the exposure factors used for these indirect pathways.

Response:

DOE does not believe that the beef and dairy product ingestion rates from OSWER Directive 9285.6-03, "Human Health Evaluation Manual, Supplemental Guidance: 'Standard Default Exposure Factors'," should be used at OU 3. First, the OSWER Directive does contain beef and dairy product ingestion rates, but an exposure frequency associated with these ingestion rates is not given. The exposure frequency is an integral part of any intake equation and should have been included. Also, the reference states that these beef and dairy product ingestion rates are "reasonable worst case consumption rates." This language is not consistent with the Reasonable Maximum Exposure (RME) concept which is commonplace in human health risk assessments. Lastly, the beef and dairy product ingestion rates were not in the summary table entitled, "Summary of Standard Default Exposure Factors." This further emphasizes that they were not promulgated for use in the OSWER directive.

DOE will not consider the higher average and 95th percentile values for beef and milk intake presented in the draft EFH, since this guidance document is still out for comment.

**34. Appendix A - Attachment 3, Table 2**



This table does not use a site-wide average for each AOC, as was implied in the text on page A-62. Instead, the table uses these sample concentration values, which are the average of two samplings taken at the sites where the three highest concentrations of Pu were found that exceeded the RBC for soil exposure to a resident. The text needs to be revised to more clearly explain how the values were derived.

Response:

Attachment 3, Table 2 applies to IHSS 199 which assesses surface soil risks. The evaluation of surface soil samples in IHSS 199 is discussed in Section A5.2.1, "Exposure Scenarios for IHSS 199 - Soils Contamination," on Page A-59. The discussion referenced on Page A-62 applies to IHSS 200, Great Western Reservoir surface sediments. Text will be revised to more clearly explain how the values were derived.

35. **Appendix A - Attachment 3, Table 14 (and other applicable tables)**  
**Please provide the reference for the assumption in the footnote that 6% of vegetables ingested are leafy and 96% are reproductive/storage vegetables.**

Response:

Table 2.2 of A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture (ORNL-5786), dated 1984 was used to define these vegetable fractions.

36. **Appendix A - Attachment 3, Table 29**  
**"Recreation" is misspelled in the title.**

Response:

Comment incorporated.